THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 12

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte JOHN E. BISHOP, and DONALD A. CARIGNAN

Appeal No. 95-3042
Application 08/098,501[1]

ON BRIEF

Before THOMAS, KRASS, and BARRETT, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1 through 22, all of the pending claims.

The invention pertains to debugging computer programs and is best illustrated by reference to representative independent claim 1 reproduced as follows:

1. A method of operating a digital computer for interactive debugging of a computer program; said digital computer having a data processor, a random-access memory, and a display for displaying

[1] Application for patent filed July 28, 1993.

information to a user; said data processor having a plurality of registers; said computer program including a sequence of instructions; said method comprising the steps of:

a) executing said sequence of instructions in a forward direction in order to create a current state of said memory and said registers for said computer program, maintaining said current state, and, for each instruction that is executed, recording in a main log pre-existing values of any registers and memory locations that are changed by said each instruction, whereby said main log does not include said current state; and

b) after said step a), simulating reverse execution of said computer program by displaying to said user contents of specified ones of said registers and memory locations that existed during forward execution of the computer program at a specified time in the past; wherein the contents of the specified ones of said registers and memory locations are reconstructed for said computer program by performing the steps comprising

i) forward searching in said main log for entries that include values of said specified ones of said registers and memory locations; wherein, for each of said specified ones of said registers and memory locations, said main log is searched beginning at a location corresponding to said specified time in the past and continuing until either a value is found for said each of said specified ones of said registers and memory locations or until an end of said main log is reached, and

ii) when the end of said main log is reached, obtaining a value from said current state for said each of said specified ones of said registers and memory locations for which a value had not been found in said main log.

The examiner relies on the following references:

Padawer et al. (Padawer)	5,124,989	Jun. 23, 1992

Balzer, ¨EXDAMS - EXtendable Debugging and Monitoring System,¨ Spring Joint Computer Conference, vol. 33, pp. 567-580 (1969)

Claims 1 through 22 stand rejected under 35 U.S.C. § 103 as unpatentable over Padawer in view of Balzer.

Reference is made to the brief and answer for the respective positions of appellants and the examiner.

OPINION

We have carefully considered the evidence before us including, inter alia, the arguments presented by both appellants and the examiner and, based upon that evidence, we will not sustain the rejection of claims 1 through 22 under 35 U.S.C. § 103.

Pointing to various portions of Padawer at pages 4-6 of the answer, the examiner contends, at least with regard to the independent claims, that Padawer discloses everything but the recording of the register and memory location values that are changed by instructions, as claimed. The examiner relies on Balzer for the teaching of this aspect of the claimed invention, particularly pointing to page 570 of Balzer and contending that Balzer teaches a history tape for storing necessary information, including variable values, about program actions. The examiner then concludes that the storage of register and memory location values, as recited in independent claim 1 is taught and that it would have been obvious to

modify Padawer by saving the variable value information for each instruction to a record as is done by Balzer because of a "desire to improve the program debugging process."

The examiner also admits [answer, page 6] that neither Padawer nor Balzer teaches the use of different logs for holding the value information. "Nor is there a disclosure of the method for retrieving the information from the plural logs as in claims 1 and 10." Nevertheless, the examiner concludes that it would have been

> obvious to one of ordinary skill in the art to store the variable value information for distinct runs or simulations in distinct logs since storage in the same log would require an overwrite of previous information. It would be very helpful to a debugger to maintain the results of different simulations or runs so as to be able to compare them to see if results changed.

The examiner continues, at page 6 of the answer:

> The modification to include plural logs would clearly necessitate the retrieval of information from the logs as in claims 1 and 10. Balzer teaches on page 572 that the history is searched in a forward or backward direction for the next occurrence of a value change depending upon which direction the execution is going. This teaches the searching claimed in claims 1 and 10 as they are best understood. It would have been obvious to modify Padawer et al by including the plural logs as discussed above. And this modification would necessitate the

> searching of each of the logs to retrieve information.
>
> Each of the independent claims requires
>
> ...for each instruction that is executed, recording in a main log pre-existing values of any registers and memory locations that are changed by said each instruction, whereby said main log does not include said current state.

As noted, supra, by the examiner and agreed with by appellants and us, Padawer does not disclose this claimed feature. The examiner relies on Balzer. However, our review of Balzer finds us in agreement with appellants that while Balzer does, indeed, teach the recording of values, it is only the recordation of "new values" resulting from instruction execution that is taught by Balzer [appellants point to the fifth line up from the bottom of the page on page 577 of Balzer]. Balzer does not, in any way, teach or suggest the "pre-existing values," or, accordingly, the recording of those "pre-existing" values, as required by the instant claims.

As discussed at pages 2-4 of the instant specification, Balzer suffered from the disadvantage that

> [a]lthough flowback analysis permits the programmer to view the values of named program variables, it does not simulate past program state, and therefore cannot recreate values in heap-allocated memory...

Therefore, one of the disclosed, and claimed, improvements of the instant claimed invention over Balzer is the ability to simulate a past program state by employing "pre-existing" values of registers and memory locations. This is crucial to the instant claimed invention, yet neither of the applied references discloses or suggests these "pre-existing" values. Even the examiner eventually admitted as such when, on the bottom of page 9 of the answer, in responding to appellants' arguments, the examiner states, "[t]he fact that applicants [sic] system stores pre-existing values rather than new values of Balzer (see page 577, fifth line from last) does not constitute a patentable difference." The examiner's contention is that this is merely "an engineering choice since either method has the effect of recording the changing of values, so that the system state at a particular point in time can be reconstructed [pages 9-10 of the answer].

We agree with appellants, at page 9 of the brief, wherein they argue that the distinction between the claimed "pre-existing values" and Balzer's "new" values is more than a mere "engineering choice." Appellants have the ability to simulate a past program state by employing these "pre-existing" values of registers and memory locations." The examiner has failed to show any support in the prior art for the allegation of "engineering choice." Further,

we are unconvinced of any teaching or suggestion anywhere in the applied references that would have led the artisan to store "pre-existing" values in Balzer (or in Padawer).

Accordingly, for the "pre-existing values" claim limitation, alone, we hold that the examiner has failed to establish a prima facie case of obviousness with regard to the claimed subject matter. We do not contend that there are no other reasons for holding that no prima facie case has been established. We simply see no reason to go any further when it is clear to us that the "pre-existing values" limitation distinguishes over the combination of references applied by the examiner.

The decision of the examiner rejecting claims 1 through 22 under 35 U.S.C. § 103 is reversed.

REVERSED

James D. Thomas Administrative Patent Judge	)	
Errol A. Krass Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES

)
)
Lee E. Barrett)
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